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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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RueyJen Hwu

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EXAMINER

MACCHIAROLO, PETER J

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 04/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

11A

Office Action Summary	Application No. 10/067,625	Applicant(s) HWU ET AL.	
	Examiner Peter J. Macchiarolo	Art Unit 2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 18-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 18-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. The reply filed on 08/25/2004 consists of changes to the claims remarks related to the prior rejection of claims in the previous Office Action. The above have been entered and considered. However, pending claims 1-12, 18-32 are not allowable as explained below.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the second insulating layer (claims 27, 29, 31, 32) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will

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be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-3, 7, 9, 11, 12, 18-20, 22-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over previously cited Khan et al (USPN 5598052; "Khan") in view of Heijboer (USPN 5475281; "Heijboer").

5. Regarding claim 1, Khan shows in figures 13a-f, a device comprising a substrate (430) having a cavity (444) that extends into the substrate, the cavity having an opening on at least one surface of the substrate (See Figure 13f); an anode (434) positioned within the cavity of the substrate; a cathode (404) positioned over the opening of the cavity (See Figure 13f), wherein the anode receives electrons emitted by the cathode, and wherein the anode produces an electrical current to an external source in response to receiving the electrons; a first grid (412) having at least one aperture (416 and 418) to allow the passage of electrons there through, wherein the first grid is constructed of an electrically conductive material, and wherein the aperture of the first grid is positioned between the cathode and anode (See Figure 13f); a seal for creating a controlled environment in an area surrounding the first grid, cathode and anode, wherein the controlled environment allows for electron flow between the cathode, first grid and anode

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(Column 13, Line 60 - Column 14, Line 7); a circuit for heating the cathode (Column 4, Lines 50-58), and a control circuit for controlling the magnitude of the flow of electrons through the aperture of the first grid (Column 14, Lines 8-26), thereby controlling the electrical current produced by the anode.

6. Khan is silent to the cathode comprising a first insulating layer.

7. However, Heijboer discloses that this configuration will allow for a more efficient heated electron emission cathode having an increased sensitivity and faster response time.

8. Therefore, in view of the above discussion, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the device of Khan with the cathode comprising an insulating layer of Heijboer to increase the device's heat sensitivity and reduced response time.

9. Regarding claim 2, Khan shows in Figure 13f the grid as being mounted on the cathode rather than the anode as claimed however Khan also discloses that the location of the cathode and the anode may be switched (Column 14, Lines 50-52).

10. Regarding claim 3, Khan further discloses that the first grid should be configured with a plurality of apertures (416 and 418) sized to allow the first grid to control the flow of electrons from the cathode to the anode when a control voltage is applied to the first grid (Column 13, Lines 20-27).

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11. Regarding claim 7, Khan further discloses that the cathode may comprise an electron emitting coating disposed thereon (Column 13, Lines 6-8).

12. Regarding claim 9, Khan further discloses that the distance between the anode and cathode may fall between 0.5 microns and 2 millimeters (see Column 3, Lines 36-42 which discloses that an appropriate spacing could be 100 microns which falls within the range claimed).

13. Regarding claim 11, Khan further discloses that the controlled environment is an enclosed area surrounding the grid, cathode, and anode, wherein the enclosed area has a vacuum drawn therein (See Figure 13 and Column 13, Lines 60-61).

14. Regarding Claim 12, Khan further discloses that the controlled environment should be an enclosed area filled with a gas selected from the group consisting of hydrogen, helium argon, and mercury (Column 11, Lines 19-22).

15. Regarding Claim 18, Khan discloses a device comprising: a substrate (430) having a cavity (444) that extends into the substrate; an anode (434) constructed of an electrically conductive material, wherein the anode is positioned in the cavity of the substrate; cathode (404) positioned over the cavity of the substrate (See Figure 13f), wherein the anode is configured to receive electrons emitted by the cathode, and wherein the anode is configured to produce an electrical current to an external source in response to receiving the electrons; a grid (412); a seal for creating a controlled environment in an area surrounding the grid, cathode and anode column

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13, Line 60 - Column 14, Line 7); and a circuit configured for heating the cathode (Column 4, Lines 50-58).

16. Khan is silent to the cathode comprising a first insulating layer.

17. However, Heijboer discloses that this configuration will allow for a more efficient heated electron emission cathode having an increased sensitivity and faster response time.

18. The reasons for combining and motivation is the same as for claim 1.

19. Regarding Claim 19, Khan further discloses that the cathode should be attached to the substrate to create a vacuum environment in an area surrounding the anode, cathode and grid (See Figure 13 and Column 13, Lines 60-61).

20. Regarding Claim 20, Khan further discloses that the cathode should contain an electron emitting coating disposed thereon (Column 13, Lines 6-8).

21. Regarding Claim 22, Khan further discloses that the space between the anode and cathode may fall between 0.5 microns and 2 millimeters (see Column 3, Lines 36-42 which discloses that an appropriate spacing could be 100 microns which falls within the range claimed).

22. Regarding claims 23, and 28, Khan is silent to an insulation layer.

23. However, Heijboer teaches that an insulating layer of ceramic (silicon nitride) may be used.

24. The reasons for combining and motivation are the same for claim 1 above.

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25. Regarding claims 24, 25, 29, 30 Khan is silent to a first conductive layer in contact with the first insulating layer.

26. However, Heijboer shows in figure 1 that a first conductive layer (molybdenum layer 9) is in contact with the first insulating layer, and this configuration allows for proper operation of the heating strips and efficient electron emission.

27. Therefore, in view of the above discussion, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the device of Khan with a first conductive layer in contact with the first insulating layer, since Heijboer teaches this configuration allows for proper operation of the heating strips and efficient electron emission.

28. Regarding claims 26, 27, 31, and 32, Khan is silent to a second conductive layer in contact with the first insulating layer.

29. However, Heijboer shows in figure 1 that a second conductive layer (pads 14) in contact with the first insulating layer, and an insulating layer of silicon oxide (4) is in contact with the second conductive layer.

30. The reasons for combining and motivation are the same for claim 24 above.

31. Claims 4-6, 8, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khan in view of Heijboer in further view of previously cited Curtin et al (USPN 5686790; "Curtin").

32. Regarding claims 4-6, Khan discloses that the cathode should be attached to the substrate to create a vacuum environment in an area surrounding the grids, anode and cathode (See Figure 13 and Column 13, Lines 60-61).

33. Khan and Heijboer are silent to a second grid having a plurality of apertures configured for allowing the passage of electrons there through, wherein the aperture of the second grid is positioned between the cathode and anode, and wherein the second grid controls the flow of electrons from the cathode to the anode when a control voltage is applied to the second grid; and that the plurality of apertures of the second grid should be aligned with the plurality of apertures of the first grid.

34. However, Curtin teaches that a second grid should be positioned on the first grid such that the plurality of apertures of the second grid are aligned with the plurality of apertures of the first grid to allow the passage of electrons there through in order to further limit the passage of electrons that are not directed toward the intended location (See Figure 2B, 207a multi-layered grid).

35. Therefore, in view of the above discussion, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use multiple grids as taught by Curtin in the device of Khan and Heijboer in order to better limit the passage of electrons that are not directed toward the intended location.

36. Regarding claims 8 and 21, Khan and Heijboer are silent to the electron emitting coating comprising a metal tricarbonatate.

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37. However, Curtin teaches that metal tricarbonates are commonly used to coat cathodes in order to improve their electron emissive properties (Column 15, Lines 39-45).

38. Therefore, in view of the above discussion, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the device of Khan and Heijboer with Curtin's tricarbonates coating to improve the electron emissive properties.

39. **Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan in view of Heijboer in further view of previously cited Jin et al (USPN 6465132; "Jin").**

40. Regarding claim 10, Khan is silent to the desired material for the grid is tungsten, gold, or tantalum, instead merely states that it should be a metal.

41. However, Jin teaches that highly conductive metals such as tungsten should be used to better control the direction of the emitted electrons (Column 12, Lines 30-35).

42. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use the grid material taught by Jin in the device of Khan and Heijboer to better control the direction of the emitted electrons.

Response to Arguments

43. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

44. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

45. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Macchiarolo whose telephone number is (571) 272-2375. The examiner can normally be reached on 8:30 - 5:00, M-F.

47. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar Patel can be reached on (571) 272-2475. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

48. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature consisting of the letters 'pm' in a cursive style, enclosed within a circular outline.A handwritten signature in cursive script, appearing to read 'Joseph Williams', positioned above the printed name.
JOSEPH WILLIAMS
PRIMARY EXAMINER